

WHAT IS CLAIMED IS:

- 1 1. An apparatus for optically scanning a scene comprising:
2 an emitting part adapted to project an optical emitted
3 beam onto the scene and to move the emitted beam relative
4 to the scene; and
5 a receiving part adapted to receive and detect a
6 reflected beam arising from a reflection of the emitted
7 beam from the scene;
8 wherein said emitting part comprises:
9 an optical radiation source adapted to generate and
10 emit the emitted beam;
11 a first prism element that is bounded by plural side
12 surfaces, and that is rotatable about a first rotation
13 axis, and that is positioned in a beam path of the emitted
14 beam emitted by the optical radiation source so that the
15 emitted beam penetrates into said first prism element and
16 is deflected by an internal total reflection of the emitted
17 beam from a respective one of said side surfaces of said
18 first prism element dependent on a rotational position of
19 said first prism element.
- 1 2. The apparatus according to claim 1, wherein said first
2 prism element is so adapted and is positioned in the beam
3 path of the emitted beam so that the emitted beam is
4 further deflected by refraction upon penetrating into
5 and/or upon exiting from said first prism element, whereby
6 a total deflection of the emitted beam caused by said first

7 prism element includes the refraction and the internal
8 total reflection of the emitted beam.

1 3. The apparatus according to claim 1, wherein said emitting
2 part includes only a single rotatable prism being said
3 first prism element and does not include any other
4 rotatable prism in the beam path of the emitted beam
5 between said optical radiation source and the scene.

1 4. The apparatus according to claim 1, wherein said emitting
2 part further comprises a first lens arrangement that is
3 interposed in the beam path of the emitted beam between
4 said first prism element and the scene, and that is adapted
5 to focus the emitted beam onto the scene.

1 5. The apparatus according to claim 1, wherein said receiving
2 part comprises:

3 a photodetector adapted to detect the reflected beam;
4 and

5 a second prism element that includes plural side
6 surfaces and has a same configuration as said first prism
7 element, and that is rotatable about a second rotation axis
8 synchronously and in a same rotation direction as a
9 rotation of said first prism element about said first
10 rotation axis, and that is positioned in a beam path of the
11 reflected beam coming from the scene so that the reflected
12 beam penetrates into said second prism element and is
13 deflected by an internal total reflection of the reflected

14 beam from a respective one of said side surfaces of said
15 second prism element dependent on a rotational position of
16 said second prism element, and the reflected beam is
17 thereby directed onto said photodetector.

1 6. The apparatus according to claim 5, wherein said receiving
2 part further comprises a second lens arrangement that is
3 interposed in the beam path of the reflected beam between
4 the scene and said second prism element, and that is
5 adapted to focus the reflected beam.

1 7. The apparatus according to claim 5, wherein said first
2 prism element and said second prism element are respective
3 discrete individual first and second prism bodies, and
4 wherein said first rotation axis and said second rotation
5 axis are spaced apart and parallel relative to one another.

1 8. The apparatus according to claim 5, wherein said first
2 prism element and said second prism element are respective
3 discrete individual first and second prism bodies, and
4 wherein said first rotation axis and said second rotation
5 axis are coincident with one another along a single axis.

1 9. The apparatus according to claim 5, wherein said first
2 prism element and said second prism element are respective
3 first and second portions of a single monolithic prism
4 body, and wherein said first rotation axis and said second

rotation axis are coincident with one another along a single axis.

10. The apparatus according to claim 1, wherein said plural side surfaces of said first prism element are respectively tilted at respective different tilt angles relative to said first rotation axis, such that the emitted beam is deflected respectively along different deflection planes at different angles relative to said first rotation axis by the internal total reflection of the emitted beam respectively by different ones of said side surfaces as said first prism element rotates.

11. The apparatus according to claim 10, wherein said tilt angles are selected so that said deflection planes respectively give rise to plural scanning lines of the emitted beam being scanned successively across the scene, without gaps between successive ones of the scanning lines.

12. The apparatus according to claim 10, wherein said first prism element has a total of exactly three of said side surfaces, which respectively have said different tilt angles being 2°, 3° and 4° respectively.

1 **13.** A method of using the apparatus according to claim 1,
2 comprising the steps:

- 3 a) projecting said emitted beam from said emitting part
4 onto said scene being a scene of an environment
5 surrounding a motor vehicle;
6 b) receiving said reflected beam with said receiving
7 part;
8 c) evaluating said reflected beam by pattern recognition
9 of a progression of reflection values of said
10 reflected beam over time, so as to recognize objects
11 in said environment surrounding said motor vehicle.

1 **14.** A method of using the apparatus according to claim 1,
2 comprising the steps:

- 3 a) projecting said emitted beam from said emitting part
4 onto said scene being a scene of an environment
5 surrounding a motor vehicle;
6 b) receiving said reflected beam with said receiving
7 part;
8 c) evaluating a transit time of a signal pulse emitted in
9 said emitted beam and received as a reflection in said
10 reflected beam to determine therefrom a spacing
11 distance between said motor vehicle and an object in
12 said environment surrounding said motor vehicle; and
13 d) depending on and responsive to said spacing distance
14 determined in said step c), emitting a warning or
15 actuating a spacing distance regulation.

1 **15.** An apparatus for optically scanning a scene comprising:

2 an emitting part adapted to project an optical emitted
3 beam onto the scene and to move the emitted beam relative
4 to the scene; and

5 a receiving part adapted to receive and detect a
6 reflected beam arising from a reflection of the emitted
7 beam from the scene;

8 wherein said emitting part comprises:

9 a first prism element that is rotatable about a first
10 rotation axis, and that is bounded by plural side surfaces
11 which are respectively tilted at different tilt angles
12 relative to said first rotation axis; and

13 an optical radiation source adapted to generate the
14 emitted beam and arranged to emit the emitted beam toward
15 said first prism element so that the emitted beam
16 penetrates into said first prism element and is deflected
17 by an internal total reflection from a respective one of
18 said side surfaces.

1 **16.** A method of optically scanning a scene, comprising the
2 steps:

- 3 a) generating and emitting an emitted beam of light;
4 b) rotating a first prism element bounded by plural side
5 surfaces about a first rotation axis; and
6 c) deflecting said emitted beam onto said scene using
7 said first prism element, wherein said deflecting
8 comprises penetrating said emitted beam into said
9 first prism element and internally reflecting said

10 emitted beam in said first prism element by a total
11 reflection of said emitted beam from a respective one
12 of said side surfaces;
13 wherein said rotating of said first prism element during
14 said deflecting causes said emitted beam to be moved over
15 said scene.

1 17. The method according to claim 16, wherein said deflecting
2 of said emitted beam further comprises refracting said
3 emitted beam upon entering into and/or exiting from said
4 first prism element.

1 18. The method according to claim 16, further comprising, after
2 said step c), projecting said emitted beam through a first
3 lens arrangement onto said scene.

1 19. The method according to claim 16, further comprising
2 reflecting at least a portion of said emitted beam from
3 said scene to form a reflected beam, and deflecting said
4 reflected beam by an internal total reflection thereof in
5 said first prism element or in a second prism element
6 having the same configuration as said first prism element
7 so as to direct said reflected beam onto a photodetector.

1 20. The method according to claim 19, further comprising
2 passing said reflected beam through a second lens
3 arrangement.

1 **21.** The method according to claim 19, wherein said deflecting
2 of said reflected beam comprises using said second prism
3 element, and further comprising rotating said second prism
4 element with the same rotation speed in the same rotation
5 direction as said first prism element about said first
6 rotation axis or about a second rotation axis parallel to
7 said first rotation axis.

1 **22.** The method according to claim 16, wherein said plural side
2 surfaces of said first prism element are respectively
3 oriented with respective different tilt angles relative to
4 said first rotation axis, and wherein said deflecting
5 comprises successively reflecting said emitted beam from
6 successive ones of said side surfaces in succession as said
7 first prism element is rotated, whereby said successive
8 ones of said side surfaces respectively reflect said
9 emitted beam along respective differently angled deflection
10 planes dependent on said different tilt angles, and said
11 differently angled deflection planes respectively give rise
12 to successive scan lines of said emitted beam being moved
13 over said scene.

1 **23.** The method according to claim 16, wherein said step a)
2 comprises generating said emitted beam as a beam of laser
3 light.

1 **24.** The method according to claim 16, further comprising
2 determining a spacing distance between a motor vehicle and
3 an object in said scene being an environment in front of
4 said vehicle by evaluating a reflected signal arising from
5 a reflection of said emitted beam from said object.